

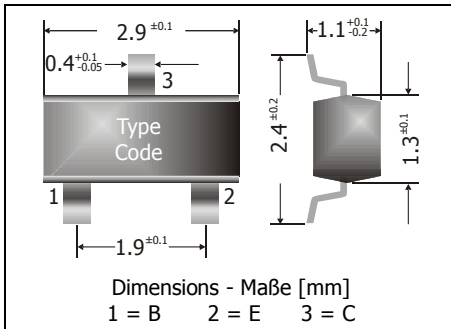
## MMBT2222A

NPN

Surface Mount Si-Epi-Planar Switching Transistors  
Si-Epi-Planar Schalttransistoren für die Oberflächenmontage

NPN

Version 2015-05-12



Power dissipation – Verlustleistung

250 mW

Plastic case  
KunststoffgehäuseSOT-23  
(TO-236)

Weight approx. – Gewicht ca.

0.01 g

Plastic material has UL classification 94V-0  
Gehäusematerial UL94V-0 klassifiziertStandard packaging taped and reeled  
Standard Lieferform getupet auf Rolle

### Maximum ratings (T<sub>A</sub> = 25°C)

### Grenzwerte (T<sub>A</sub> = 25°C)

|  |        |                  | MMBT2222A            |
|--|--------|------------------|----------------------|
| Collector-Emitter-volt. – Kollektor-Emitter-Spannung | B open | V <sub>CEO</sub> | 40 V                 |
| Collector-Base-voltage – Kollektor-Basis-Spannung    | E open | V <sub>CB0</sub> | 75 V                 |
| Emitter-Base-voltage – Emitter-Basis-Spannung        | C open | V <sub>EB0</sub> | 6 V                  |
| Power dissipation – Verlustleistung                  |        | P <sub>tot</sub> | 250 mW <sup>1)</sup> |
| Collector current – Kollektorstrom (dc)              |        | I <sub>C</sub>   | 600 mA               |
| Junction temperature – Sperrschichttemperatur        |        | T <sub>j</sub>   | -55...+150°C         |
| Storage temperature – Lagerungstemperatur            |        | T <sub>S</sub>   | -55...+150°C         |

### Characteristics (T<sub>j</sub> = 25°C)

### Kennwerte (T<sub>j</sub> = 25°C)

|  |           |                 | Min.    | Typ. | Max.    |
|--|-----------|-----------------|---------|------|---------|
| DC current gain – Kollektor-Basis-Stromverhältnis <sup>2)</sup>                      |           |                 |         |      |         |
| I <sub>C</sub> = 0.1 mA, V <sub>CE</sub> = 10 V                                      |           | h <sub>FE</sub> | 35      | –    | –       |
| I <sub>C</sub> = 1 mA, V <sub>CE</sub> = 10 V  |           | h <sub>FE</sub> | 50      | –    | –       |
| I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 10 V                                       |           | h <sub>FE</sub> | 75      | –    | –       |
| I <sub>C</sub> = 150 mA, V <sub>CE</sub> = 10 V                                      |           | h <sub>FE</sub> | 100     | –    | 300     |
| I <sub>C</sub> = 500 mA, V <sub>CE</sub> = 10 V <sup>2)</sup>                        | MMBT2222A | h <sub>FE</sub> | 40      | –    | –       |
| h-Parameters at/bei V <sub>CE</sub> = 10 V, f = 1 kHz, I <sub>C</sub> = 1 mA / 10 mA |           |                 |         |      |         |
| Small signal current gain<br>Kleinsignal-Stromverstärkung                            | MMBT2222A | h <sub>fe</sub> | 75      | –    | 375     |
| Input impedance – Eingangs-Impedanz  | MMBT2222A | h <sub>ie</sub> | 0.25 kΩ | –    | 1.25 kΩ |
| Output admittance – Ausgangs-Leitwert  | MMBT2222A | h <sub>oe</sub> | 25 μS   | –    | 200 μS  |

1 Mounted on P.C. board with 3 mm<sup>2</sup> copper pad at each terminal  
Montage auf Leiterplatte mit 3 mm<sup>2</sup> Kupferbelag (Löt-pad) an jedem Anschluss

2 Tested with pulses t<sub>p</sub> = 300 μs, duty cycle ≤ 2% – Gemessen mit Impulsen t<sub>p</sub> = 300 μs, Schaltverhältnis ≤ 2%

**Characteristics (T<sub>j</sub> = 25°C)****Kennwerte (T<sub>j</sub> = 25°C)**

|   |  |                    | <b>Min.</b>      | <b>Typ.</b>             | <b>Max.</b> |
|---|--|--------------------|------------------|-------------------------|-------------|
| Collector-Emitter saturation voltage – Kollektor-Sättigungsspannung <sup>2)</sup>           |  |                    |                  |                         |             |
| I <sub>C</sub> = 150 mA, I <sub>B</sub> = 15 mA   | MMBT2222A  | V <sub>CEsat</sub> | –                | –                       | 0.3 V       |
| I <sub>C</sub> = 500 mA, I <sub>B</sub> = 50 mA   | MMBT2222A  | V <sub>CEsat</sub> | –                | –                       | 1.0 V       |
| Base-Emitter saturation voltage – Basis-Sättigungsspannung <sup>2)</sup>                    |  |                    |                  |                         |             |
| I <sub>C</sub> = 150 mA, I <sub>B</sub> = 15 mA   | MMBT2222A  | V <sub>BEsat</sub> | 0.65 V           | –                       | 1.2 V       |
| I <sub>C</sub> = 500 mA, I <sub>B</sub> = 50 mA   | MMBT2222A  | V <sub>BEsat</sub> | –                | –                       | 2.0 V       |
| Collector-Base cutoff current – Kollektor-Basis-Reststrom                                   |  |                    |                  |                         |             |
| V <sub>CB</sub> = 60 V, (E open)  | MMBT2222A  | I <sub>CBO</sub>   | –                | –                       | 10 nA       |
| V <sub>CB</sub> = 60 V, T <sub>j</sub> = 125°C, (E open)                                    | MMBT2222A  | I <sub>CBO</sub>   | –                | –                       | 10 µA       |
| Emitter-Base cutoff current – Emitter-Basis-Reststrom                                       |  |                    |                  |                         |             |
| V <sub>EB</sub> = 3 V, (C open)   | MMBT2222A  | I <sub>EB0</sub>   | –                | –                       | 100 nA      |
| Gain-Bandwidth Product – Transitfrequenz  |  |                    |                  |                         |             |
| V <sub>CE</sub> = 20 V, I <sub>C</sub> = 20 mA, f = 100 MHz                                 |  | f <sub>T</sub>     | 250 MHz          | –                       | –           |
| Collector-Base Capacitance – Kollektor-Basis-Kapazität                                      |  |                    |                  |                         |             |
| V <sub>CB</sub> = 10 V, I <sub>E</sub> = i <sub>e</sub> = 0, f = 1 MHz                      |  | C <sub>CBO</sub>   | –                | –                       | 8 pF        |
| Emitter-Base Capacitance – Emitter-Basis-Kapazität  |  |                    |                  |                         |             |
| V <sub>EB</sub> = 0.5 V, I <sub>C</sub> = i <sub>c</sub> = 0, f = 1 MHz                     |  | C <sub>EBO</sub>   | –                | –                       | 25 pF       |
| Noise figure – Rauschzahl   |  |                    |                  |                         |             |
| V <sub>CE</sub> = 10 V, I <sub>C</sub> = 100 µA, R <sub>G</sub> = 1 kΩ, f = 1 kHz           | MMBT2222A  | F                  | –                | –                       | 4 dB        |
| Switching times – Schaltzeiten (between 10% and 90% levels)                                 |  |                    |                  |                         |             |
| delay time  | V <sub>CC</sub> = 3 V, V <sub>BE</sub> = 0.5 V   | t <sub>d</sub>     | –                | –                       | 10 ns       |
| rise time   | I <sub>C</sub> = 150 mA, I <sub>B1</sub> = 15 mA | t <sub>r</sub>     | –                | –                       | 25 ns       |
| storage time  | V <sub>CC</sub> = 3 V, I <sub>C</sub> = 150 mA,  | t <sub>s</sub>     | –                | –                       | 225 ns      |
| fall time   | I <sub>B1</sub> = I <sub>B2</sub> = 15 mA        | t <sub>f</sub>     | –                | –                       | 60 ns       |
| Thermal resistance junction to ambient air<br>Wärmewiderstand Sperrschicht – umgebende Luft |  |                    | R <sub>thA</sub> | < 420 K/W <sup>1)</sup> |             |
| Recommended complementary PNP transistors<br>Empfohlene komplementäre PNP-Transistoren      |  |                    | MMBT2709A        |                         |             |
| Marking - Stempelung  |  |                    | MMBT2222A = 1P   |                         |             |

<sup>2)</sup> Tested with pulses t<sub>p</sub> = 300 µs, duty cycle ≤ 2% – Gemessen mit Impulsen t<sub>p</sub> = 300 µs, Schaltverhältnis ≤ 2%

<sup>1)</sup> Mounted on P.C. board with 3 mm<sup>2</sup> copper pad at each terminal  
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